Proposed synopsis leading to the award of Ph.D Degree R.U.

A Study of calcium deficiency among working women, in Ranchi.

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STATE OF THE ART :

Nutrition plays a pivotal role in maintaining optimal health and well-being, yet the dietary habits of working women remain an area of concern due to the unique challenges they face in balancing career demands with healthy lifestyle choices. Among the essential nutrients crucial for women's health, calcium is important for bone health and overall metabolic function. Adequate calcium intake is especially vital during periods of high bone turnover, such as adolescence, pregnancy, and menopause, to prevent the onset of osteoporosis and related bone disorders. Calcium a micronutrient is an essential component of the body required for building strong bones and teeth, clotting of blood , maintaining neuromuscular activity, cardiovascular health and muscle function and many other. Our body is unable to synthsise calcium on its own so it is required through our diet. Calcium rich products include dairy products, green leafy vegetables, nuts and seeds, ragi and many more. Calcium is required in sufficient amount throughout the life cycle of human development . A diet low in calcium may cause symptoms like brittle nails, dry skin, cramping, heart palpitations, fatigue and may lead to osteopenia, osteoporosis and increased incidence of fracture in later stages of women's life. Working women with multiple responsibilities both in and out of the workplace, may encounter barriers to achieve optimal dietary patterns and calcium intake. Factors such as time constraints, work-related stress, and socioeconomic disparities can influence dietary choices among them.

According to a Journal by **Shilsky Julie et. al**.[1] "dietary calcium deficiency is considered to be widespread globally , with published estimated suggesting that approximately half of the world's population has inadequate access to dietary calcium. Calcium is essential for bone health, but inadequate intake have also been linked to other health outcomes, including pregnancy complications, cancers and cardiovascular disease . Population in low and middle income group are at a greater risk of low calcium intake, although many individuals in high income group also do not meet recommendation."

Priti Maja Warzecha[2] in his study of **Calcium Consumption In Diet Of Elderly** states "proper nutrition based on an adequate supply of nutrients directly affects health. Deficiencies of calcium are seen at nutritional risk factor as far as osteoporosis is concerned. It is possible to assess calcium deficiency on the basis of blood serum which largely depends on the content of calcium in a diet, absorption on the gastrointestinal tract , tubular reabsorption and calcium build up in the bones."

According to a study by **E.M. Balk and G.P. Adam** [3]"the contribution of dietary calcium intake to bone mass easiest to document during late in life when bone loss occurs at a rate of about 1%per year, resulting in calcium loss approximately 15g per year. Low calcium intake may adversely affect the development of peak bone mass."

Yupeng Liu [4]states "Osteoporosis and bone fractures are common problems among older people, particularly older women. These conditions cause disability and reduce quality of life.

Progressive loss of bone mineral density is usually the culprit. So far, strategies to prevent bone weakening with age have produced disappointing results. For example, taking calcium supplements in later life only slightly reduces the risk of osteoporosis or fracture. New approaches are needed .Bone mass increases gradually early in life and peaks and plateaus around 20-35 years of age. After that period, bone mass slowly declines."

Christopher S. Kovacs on Calcium and Bone Metabolism in Pregnancy and Lactation [5] The normal fetal skeleton has accreted about 30 g calcium by the end of gestation, but about 80% of the accretion occurs rapidly during the third trimester. This corresponds to a daily accretion rate of about 250–300 mg calcium by the fetal skeleton during the third trimester. The typical daily loss of calcium in breast milk has been estimated to range from 280–400 mg, although daily losses as great as 1000 mg calcium.

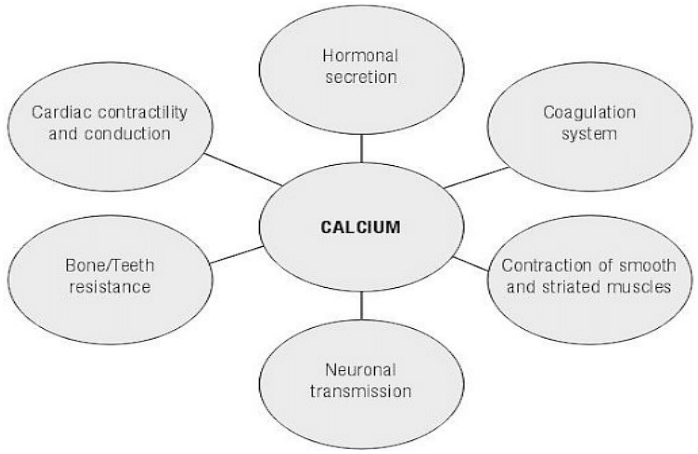
SOONTRAPA S. et. al [6]Adequate and appropriate calcium intake is very important. The excessive or inappropriate calcium intake might cause undesirable side effects, including lower iron absorption, constipation, flatulence, urinary stone, myocardial infarction, etc.However, an adequate calcium intake during pregnancy might prevent preterm birth, fetal growth restriction, increasing maternal bone mass, and reduce fracture risks

Ashok Kumar and Simar Kaur on Calcium: A Nutrient In Pregnancy [7]states– Low calcium intakes during pregnancy may stimulate PTH secretion, increasing intracellular calcium and smooth muscle contractibility and release renin from the kidney, leading to vasoconstriction and retention of sodium and fluid. These physiological changes can lead to the development of preeclampsia. Calcium supplementation in pregnancy has the potential to reduce adverse gestational outcomes, in particular by decreasing the risk of developing hypertensive disorders during pregnancy, which are associated with a significant number of maternal deaths and considerable risk of preterm birth, the leading cause of early neonatal and infant mortality.

As per **ICMR –NIN ,RDA**[8] of calcium for women is 1000mg/day while for pregnant and lactating women it is 1200mg/day .

According to Heathians Patholab the normal range of serum calcium is 8.6-10.2 mg/dl.

FUNCTIONS OF CALCIUM



(Source- Archives of Endocrinology)

Review of Literature :-

- **HEANEY R P et. al. (1982)** – the Journal entitled "Calcium Nutrition And Bone Health In The Elderly " suggests that RDA of calcium among elderly should be sufficient and not be too low (<800mg) because the average person is in negative calcium balance and accordingly is losing bone mass.[9]
- **ISLAM M .Z. et. al.(2003)** Article entitled "Dietary Calcium Intake In Premenopausal Bangladeshi Women" , conducted a cross sectional study to evaluate calcium intake using three days dietary recall. The study included housewives as well as working women, the calcium intake was affected by socioeconomic status of the women , none of the participants fulfilled their dietary requirements of calcium and majority showed low calcium intake .[10]
- **PISTE PRAVINA et.al**. **(2012)** in the article Calcium And It's Role In Human Health states- first sign of calcium deficiency is muscle cramping which usually occurs at night, the other signs and symptoms include dry skin, brittle nails, yellowing of teeth ,increased PMS symptoms, bone fracture and breakage, heart palpitations, insomnia and others. Calcium intake in sufficient quantity is important to maintain normal functioning of the body.[11]

- **ARNAUD LAILLOU et.al. (2013)** A nationwide food consumption survey was carried in Vietnam which employed anthropometric measurement , blood sampling to analyse calcium and Vitamin D level and analysis of consumption pattern was done. The study showed that calcium and vitamin D deficiency was a major public health concern and consumption was calcium rich foods was very low and was also affected by socioeconomic status of the population.[12]

- **TAHMEED AHMED and W. FAWZI (2016)** – the article "calcium deficiency in Bangladesh :burden and proposed solution" highlights the low calcium intake in general population of Bangladesh due to poor access to dietary calcium sources , so a tablet supplementation program is considered to be effective. [13]

- **PRIYADARSHINI V. (2016)** research paper on "A comparative study on dietary patterns and nutritional Status among working and non-working women of Keonjhar city" states that , Women's nutrition has a significant positive effect. As healthy women can fulfill the multiple roles of having healthy children, income generation, ensuring the nutrition of family members etc. Sound knowledge about good Nutrition, balanced diet can affect the health and Nutritional status of the whole family. In big joint families the per capita consumption of food decreases for the women as a tradition women eat last and which many times are quite less than requirements. Most of the time the women who take care the health and nutrition of the family ignores own, so awareness generation is needed to promote healthy and sound food habits among the women.[14]

- **GODA T. S. et. al. (2018)** the Journal entitled "Assess the Knowledge, Practice and Attitude of Pregnant Women for Effect, of Calcium During Pregnancy". The participants were 300 pregnant women selected from outpatient clinic for pregnant women, in Obstetrics and gynecology department at Benha university hospital .The findings were that the vast majority of studied women had incorrect knowledge regarding importance of calcium to develop a strong heart and overall strong dental and bone growth respectively of the fetus. Majority of women decrease practice of daily activities , more than half of them of them sometimes reduced their intake of calcium supplementation. The author suggested that health educational should be introduced and TV programmes should be used to create awareness among target population. [15]

- **FAROOQI L. et. al. (June 2018)** Conducted study on "Prevalence of Hypocalcemia and its Association Among Pregnant And Lactating Mothers." The participants were 400 pregnant and 400 lactating women taken from different obstetrical OPD's from Punjab, Pakistan.The study discovered that the most common co-morbid condition during pregnancy is hypertension in association with low level of serum calcium. To avoid hypertension during pregnancy calcium supplements are beneficial. The author suggested that stress is needed on maternal nourishment, to fulfill sufficient vitamin D and calcium levels, which may provide long term prevention of osteoporosis like bone conditions in future.[16]

- **RANGREZ SHADAB et. al. (2018) –**in his work "prevalence of osteoporosis ,serum vitamin D and serum calcium deficiency cases among women" The study was conducted on women who visited orthopaedic OPD in Belagavi , India . Serum calcium, serum Vitamin D and DEXA was used to analyse the prevalence of osteoporosis. It was found

that maximum women were osteoporotic and age was an important factor affecting women's health.[17]

- **BAGADE MEGHA et.al.(2019) –** "A study of serum calcium level in premenopausal and postmenopausal women " states that calcium ion is an essential structural component of skeleton which body cannot synthesise.the study recommends the calcium supplementation to decrease the risk of bone fracture , osteoporosis among pre and post menopausal women.[18]

- **GABRIELA CORMICK and JOSE M. BELIZAN (2019) –** the journal entitled "calcium intake and health '' The study suggested the impact of calcium on human health relating it to blood pressure, cardiovascular health and cholesterol level . It emphasised on fulfilling the recommended calcium through the diet to avoid complications in later stages of life. It talks about approaches to meet dietary calcium , which can be fulfilled by behavioural intervention, supplementation or by food fortification.[19]

- **KANT SHASHI et. al. (December 2019)** Conducted a study on "Serum calcium level among pregnant women and its association with pre-eclampsia and delivery outcomes" This was a cross sectional study conducted in a secondary level hospital at Ballabgarh, district Faridabad, Haryana.A total of 696 pregnant women with gestation period more than 28 weeks were enrolled. Data was collected using schedule and 24 hours dietary recall .There was no difference in mean serum calcium level of those who had adequate dietary calcium intake as compared to those who had inadequate dietary calcium intake. Mean serum calcium level was lower among pregnant women who delivered a low birth weight newborn as compared to women who had normal weight new-born. The author suggested that there is a need to explore the effect of dietary calcium on serum calcium level and birth outcomes .[20]

- **AJONG B. J. et. al. (2020)** conducted a study on "Hypocalcaemia and calcium intake in pregnancy: A research protocol for critical analysis of risk factors, maternofoetal outcomes and evaluation of diagnostic methods in a third-category health facility, Cameroon". A total of 1067 term pregnant women were included in the study from Nkongsamba Regional Hospital, Cameroon. Data was collected using semi structured interview ,questionnaire and blood sample . This study helped to understand the factors associated with hypocalcaemia in late pregnancy which could serve to control and meet up with electrolyte imbalance in pregnancy.[21]

- **HARINARAYAN et al. (2021),** in the study "Modern India and dietary calcium deficiency -half a century nutrition data-Retrospective "although India is the largest milk-producing country, dietary calcium intake is severely deficient with all negative effects on bone health, suggesting a gap between the production and consumption of dietary calcium in Indian dietary patterns. [22]

- **BAKO B et.al. (January 2021)** conducted a study about "Prevalence and Risk Factors of Hypocalcemia Among Pregnant and Non-Pregnant Women in Maiduguri, Nigeria". This was a comparative cross-sectional study at the University of Maiduguri Teaching Hospital, Maiduguri with a total of 1,500 (1,000 pregnant and 500 non-pregnant) women . The study showed that hypocalcemia is more prevalent among pregnant women compared to their non-pregnant counterparts and serum calcium levels were lowest in the third trimester. The author recommend routine calcium supplementation for women of reproductive age during the preconception and antenatal and most of women during pregnancy were asymptomatic of hypocalcemia. [23]

- **SALWUTHRA A. & AHMED F.(2023)** – conducted a study on Dietary Pattern, Nutrition-Related Knowledge and Attitudes of Working Women in Western Province, Sri Lanka. This study provides insight into the nutritional status, dietary pattern and nutrition-related knowledge and attitudes towards healthy eating of working women in Western Province, Sri Lanka .Over half of the working women were either overweight or obese , whereas only a few are underweight. One in four working women did not consume milk and milk products at all and another 20% of the women had it occasionally.[24]

Problem to be investigated

The problem to be investigated in this research is the dietary patterns and calcium intake status of working women belonging to age group of 25-45 years, with a specific focus on assessing calcium deficiency. This involves understanding the types and quantities of foods consumed by working women, identifying any deficiencies or imbalances in their calcium intake, and exploring factors contributing to dietary patterns. By addressing this problem, the research aims to shed light on the nutritional health of working women and inform strategies to promote better dietary habits and calcium intake among them so as to prevent problems which arises due to hypocalcemia as they enter into pregnancy, lactation and menopause which are the critical stages of life of women.

Objectives :

- To know the socioeconomic status of working women.
- To evaluate the dietary patterns of working women.
- To quantify calcium intake among working women as per recommended dietary allowances and validate it through biochemical test .

Motivation of Research :

- **Women Empowerment** – women nowadays are not limited to household chores but they unveil their potential out at workplace , so an additional care to their nutritional requirement is necessary. Working women often juggle multiple responsibilities, leaving

little time to focus on their dietary habits. By investigating their dietary patterns and calcium intake, we can tailor interventions to meet their specific nutritional needs and support their overall health.

- **Health Concerns :** women undergo various stages including pregnancy , lactation and at the same time manage the responsibility of their workplace. Hypocalcemia during pregnancy leads to complications such as pre-eclampsia, pre-term birth and putv additional burden to women's health and in the later stages when menopause occurs a severe decline of calcium level occurs due to decreased estrogen production , this leads to complications such as osteoporosis, fractures.
- **Empowerment Through Knowledge** : Providing working women with information about their dietary habits and nutritional status empowers them to make informed choices about their health. This study can serve as a tool for education and advocacy, promoting healthier lifestyles among them.

Research Question:

1. What is the socioeconomic status of working women?

2.What are the dietary patterns of working women ?

3.What is the calcium intake among working women as compared to recommended dietary allowances?

4. What is the prevalence of calcium deficiency based on biochemical test?

5. What is the coorelation between serum calcium level and dietary calcium intake among working women ?

RESEARCH DESIGN AND METHODOLOGY

Type of research - This research is an exploratory research.

Source of data:

Primary data –Data will be collected from working women who are categorised under sedentary workers. School teachers, college teachers , Sales Executive and Bank Employees from urban area of Ranchi will be selected.

TOOLS AND TECHNIQUE OF DATA COLLECTION

Data will be collected by using these primary methods :

Schedule– Schedule will be conducted to gather qualitative data on participants' knowledge, attitude and behaviour regarding calcium intake .

Anthropometric measurement – height ,weight , BMI will be assessed to know nutritional status.BMI formula – weight (in kg) / height (in metre square)

Biochemical Test- Blood test to investigate serum calcium level will be done.

Dietary assessment- 24 hours recall, dietary records and food frequency questionnaire will be done to assess intake of calcium .

Variables to be used for data collection :

- **DEPENDENT VARIABLE** :-

• Height	BMI
• Weight	serum calcium level

- **INDEPENDENT VARIABLE**:-

• Age	religion
• Dietary intake of calcium	Knowledge and awareness

Method of sampling- The method employed is purposive sampling.

Area of Research – This research will be carried out in urban area of Ranchi only.

Respondents- The respondents will be women who are sedentary workers. School teachers, college teachers , Sales Executive and Bank Employees from urban area of Ranchi wil be the respondents.

Sample size –200 sedentary working women of age 25- 45 years will be included

in the study.

INCLUSION CRITERIA

- Women of age group 25-45 years are only included.
- Women who come under sedentary workers are only included.

EXCLUSION CRITERIA

- Working women who are taking calcium suppliments are excluded from the study.
- Working women with any medical condition ,past medical history and kidney diseases are excluded from the study.

Data Process and Analysis-

Data will be analysed by using various statistical procedures including mean , standard deviation and percentage . The coorelation between serum calcium level and dietary calcium intake will be assessed by Pearson's coorelation coefficient. Pearson's coorelation coefficient measures the strength and relationship between two quantitative variables, here two quantitative variables are serum calcium level and dietary calcium intake.

Significance of Study

- **PUBLIC HEALTH IMPACT** :- Calcium deficiency can lead to various health problems, including osteoporosis, osteopenia and increased risk of fractures. By identifying the prevalence and risk factors of calcium deficiency ,the study can contribute valuable insights to public health efforts aimed at preventing and managing these condition.
- **WOMEN'S HEALTH :-** Women are particularly susceptible to calcium deficiency due to factors such as pregnancy, lactation and menopause. Understanding the prevalence and determination of calcium deficiency among working women aged 30-40 years can help to manage their health..
- **HEALTH EQUITY :-.**By examining calcium deficiency among working women aged 30-40 years, the study can help identify disparities in calcium intake and access to preventive care arising due to socioeconomic status, promote health equity and reduce healthcare cost.
- **PREVENTIVE STRATEGIES :-** By identifying risk factors associated with calcium deficiency, such as dietary patterns, lifestyle behaviour ,and knowledge levels, the study can implement interventions and educational programs to prevent and reduce calcium deficiency.

Relevance to present day study:

- With increasing awareness of the importance of nutrition for overall well being and health, understanding of the dietary pattern and calcium intake among working women is important as women face various challenges in maintaining healthy eating habit due to time constraints and work related stress , making it important to assess their nutritional status and identify areas for improvement . Women particularly have specific nutritional

needs including adequate calcium intake to support bone health . This research is relevance to promote better nutrition , improve overall health of working women

Contribution to existing knowledge :

1 .Understanding Working Women's Dietary Patterns: By focusing specifically on the dietary patterns of working women, this research adds to the existing knowledge on the working women of specified age group. This is important because dietary habits can vary based on factors such as occupation, lifestyle, and socioeconomic status.

2. Assessment of Calcium Intake: Investigating calcium intake among working women provides valuable insights into their nutritional status and potential risk of calcium deficiency. This contributes to our understanding of the adequacy of calcium intake in this population , which is crucial for promoting healthy pregnancy , delivery of healthy baby maintaining bone health and preventing conditions like osteoporosis.

3.Prevalence of Calcium Deficiency: By assessing the prevalence of calcium deficiency among working women, this research fills a gap in knowledge regarding the nutritional health of this group. This information is valuable for healthcare providers, policymakers, and public health advocates working to address and prevent nutrient deficiencies.

Several avenues for future research could be :

1. Longitudinal Studies: Conduct longitudinal studies to track changes in dietary patterns and calcium intake among working women over time. This would provide insights into how dietary habits evolve with different life stages or socioeconomic changes.

2. Intervention Studies: Design and implement interventions to improve the dietary habits and calcium intake of working women. Evaluate the effectiveness of these interventions in promoting behavior change and improving nutritional outcomes.

3. Qualitative Exploration: Conduct in-depth qualitative research to explore the underlying reasons behind dietary choices among working women. This could involve interviews, focus groups, or ethnographic studies to gain a deeper understanding of cultural, social, and environmental influences on dietary behaviors.

4. Health Outcomes Research: Investigate the long-term health outcomes associated with dietary patterns and calcium intake among working women. This could include studying bone health, risk of chronic diseases, and overall mortality rates based on different dietary patterns.

Limitations of the Research:

1. **Sampling Bias:** The sample may not be representative of all working women, as recruitment is limited to specific geographic locations i.e. in urban area of Ranchi only.. This could affect the generalizability of the findings to the broader population of working women.

2. **Self-Reported Data:** Dietary assessments often rely on self-reported data, which can be subject to recall bias or misreporting. Participants may overestimate or underestimate their food intake, leading to inaccuracies in the assessment of dietary patterns and calcium intake.

3. **Social Desirability Bias**: Participants may provide responses that they perceive as socially desirable rather than accurate, especially when reporting on their dietary habits. This could lead to an overestimation of healthy food choices and an underestimation of less healthy behaviors.

Tentative Chapterisation:

Chapter 1- Introduction

Chapter 2- Review of Literature

Chapter 3- Research Design and Methodology

Chapter 4- Result and discussion

Chapter 5- Conclusion and suggestion

Reference

Appendices

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